Montana Fish, Wildlife & Parks

4600 Giant Springs Road
Great Falls MT 59405-0901

TO: Bureau of Reclamation, Montana Area Office
Environmental Quality Council
MT Dept. Environmental Quality
Greenfield Irrigation District
Montana Fish, Wildlife & Parks
Fisheries Division
Wildlife Division
Endangered Species Coordinator
MT Historical Society
MT State Library
James Jensen, Montana Environmental Information Center
Janet Ellis, Montana Audubon Council

Ladies and Gentlemen:

Montana Fish, Wildlife & Parks has developed an Environmental Assessment (EA) that proposes removal of an illegally introduced white sucker population in Tunnel Lake using the piscicide rotenone. The sucker population has expanded to the level that growth and condition of the recreational fishery has declined. The objective of this treatment is to completely remove the white sucker population and restock Tunnel Lake with westslope cutthroat trout and Arctic grayling to restore a quality angling opportunity for the public. Tunnel Lake is a natural pothole lake 14.1 surface acres in size that receives water seepage from the Pishkun Supply Canal. It is located approximately 20 miles southwest of Choteau, MT. The EA is available for viewing online at: http://fwp.mt.gov/publicnotices/default.aspx
If you would like us to send you a printed copy, please contact George Liknes at (406)454-5855.

If you have any questions, feel free to contact Dave Yerk at (406) 466-5621. Please submit any comments related to this project to the address or email below by April 3, 2008.

Tunnel Lake EA
Montana Fish, Wildlife and Parks
PO Box 733
Choteau, MT 59422
dyerk@mt.gov

Sincerely,

Dave Yerk
Fisheries Biologist

MONTANA FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

Environmental Assessment of the rotenone treatment of Tunnel Lake for the purpose of removing an expanding white sucker population and restocking to create a mixed fishery including hatchery westslope cutthroat trout and transplanted Arctic grayling.

PART I: PROPOSED ACTION DESCRIPTION

A. Type of Proposed Action: Provide better growing environment for westslope cutthroat trout and Arctic grayling to improve recreational angling opportunity.

B. Agency Authority for the Proposed Action: Montana Fish, Wildlife and Parks (MTFWP) "…is hereby authorized to perform such acts as may be necessary to the establishment and conduct of fish restoration and management projects…" under statute 87-1-702.

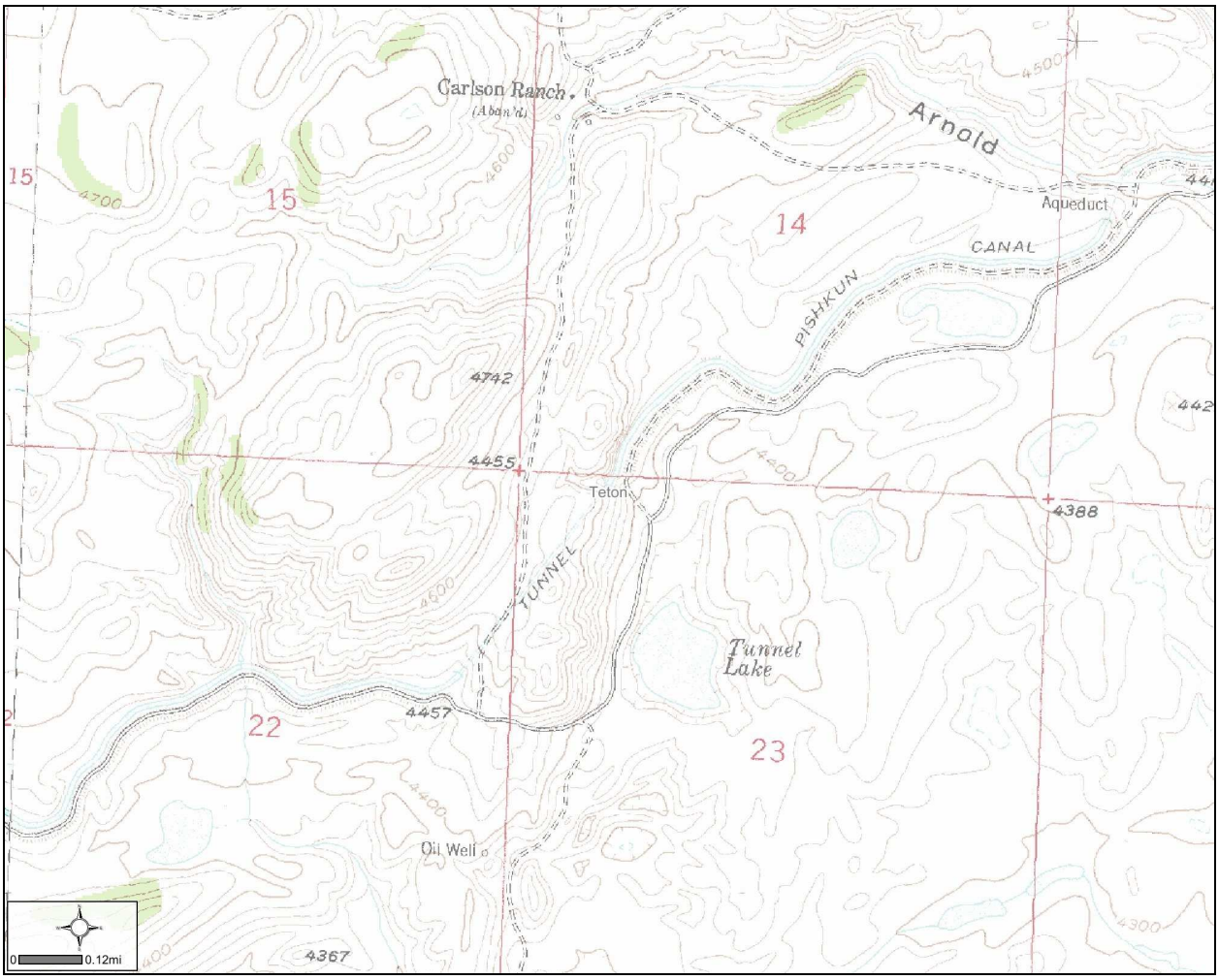
C. Estimated Commencement Date: April 2008

D. Name and Location of the Project: Improve Tunnel Lake's westslope cutthroat trout and Arctic grayling fishery through the removal of an expanding white sucker population by means of rotenone piscicide.

Tunnel Lake is located in T22N R8W Sec. 23 near the Rocky Mountain Front in the Sun River drainage approximately 20 miles southwest of Choteau, MT. It is a natural pothole lake that receives water seepage from the Pishkun Supply Canal (Figure 1). The lake is located entirely on U. S. Bureau of Reclamation land.

E. Project Size (acres affected)

1. Developed/residential – 0 acres
2. Industrial – 0 acres
3. Open space/Woodlands/Recreation – 0 acres
4. Wetlands/Riparian – Tunnel Lake is 14.1 acres in size, has a maximum depth of 26.5 feet and a volume of 160.7 acre-feet (Figure 2). There is no surface outlet from this lake. The only tributary to Tunnel Lake is a short stream segment originating from leakage from the Pishkun Supply Canal. This stream is approximately 350 feet long and flows into the lake on the north shore. Streamflow was estimated at about 1 cfs on July 2007.
5. Floodplain – 0 acres
6. Irrigated Cropland – 0 acres
7. Dry Cropland – 0 acres
8. Forestry – 0 acres
9. Rangeland – 0 acres



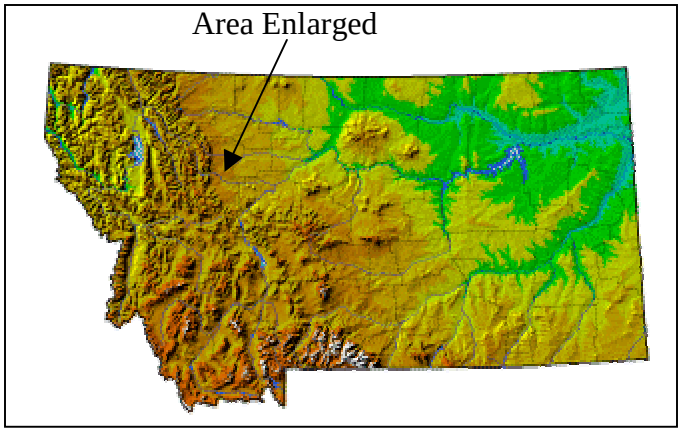


Figure 1. Map of project site.

Tunnel Lake
Teton County, MT
Township 22N, Range 8W, Section 23

Map Base: U.S. Geological Survey
7.5 minute Split Rock Lake Quadrangle

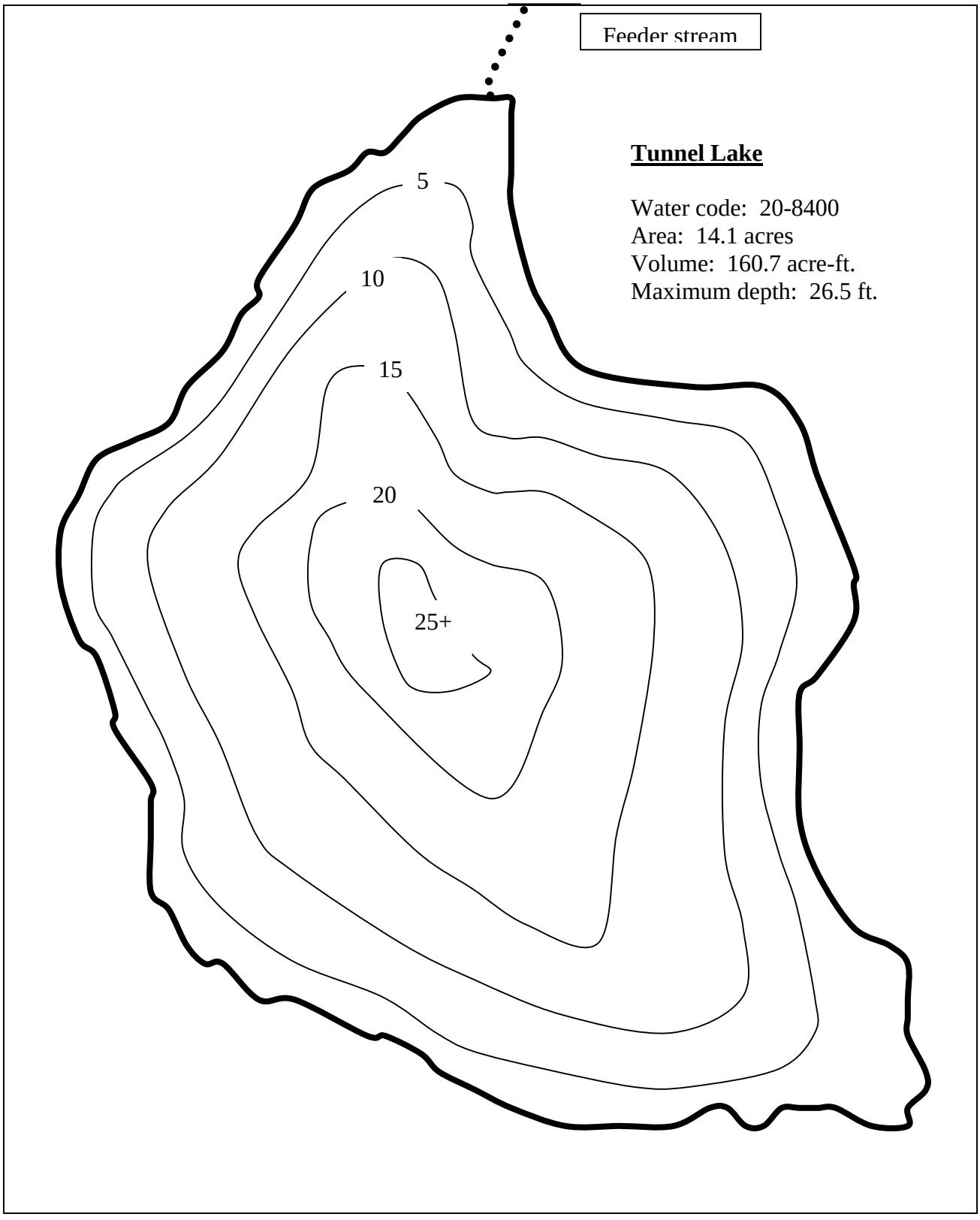


Figure 2. Bathymetric map of Tunnel Lake.

F. Narrative Summary of the Proposed Action and Purpose of the Proposed Action

Background

Tunnel Lake has historically provided quality recreational angling for cutthroat trout, rainbow trout and Artic grayling. In 1956, Tunnel Lake was treated with liquid rotenone to remove an abundant white sucker population. Following this treatment, monitoring gill net sets captured three white suckers in 1957. Tunnel Lake was again rehabilitated with rotenone in 1968. Two trap nets set in 2000 captured three white suckers and then in 2007 four trap nets captured 123 white suckers. Netting surveys completed in the mid-1970s indicated Tunnel Lake produced cutthroat trout up to 17 inches in length while white suckers were absent or in very low numbers. In recent years, survival and growth of stocked rainbow and cutthroat trout have been very poor.

Purpose

The proposed action is to remove all the fish in Tunnel Lake using the piscicides Prenfish (5% liquid rotenone) and Prentox (7% powder rotenone). Upon project completion, the lake will be restocked with hatchery produced westslope cutthroat trout and Artic grayling transplanted from the Sunnyslope Canal.

Proposed Activities

MTFWP has a long history of using rotenone to manage fish populations in Montana that spans as far back as 1948. The objectives of most of these projects were to improve angling quality and secondarily for native fish conservation.

Rotenone is a naturally occurring substance derived from the roots of tropical plants in the bean family including jewel vine (*Derris* spp.) and lacepod (*Lonchocarpus* spp.) that are found in Australia, Oceania, southern Asia, and South America. Native people have utilized rotenone for centuries to capture fish for food in areas where these plants are naturally found. It has been used in fisheries management in North America since the 1930s. Rotenone has also been used as a natural insecticide for gardening and to control parasites such as lice on domestic livestock.

Rotenone acts by inhibiting oxygen transfer at the cellular level. It is especially effective at low concentrations with fish because it is readily absorbed into the bloodstream through the thin cell layer of the gills. Mammals and other non-gill breathing organisms do not have this rapid absorption route into the bloodstream, and thus can tolerate exposure to concentrations much higher than that used to kill fish. In essence, most non-target organisms are not affected at fish killing concentrations.

The boundaries for this treatment span the entire length of the small feeder stream and Tunnel Lake itself. The waters between these two points would be treated primarily with Prenfish 5% liquid rotenone, which would be contained within these boundaries. Although surveys have detected no springs in the lake, a small amount of powdered rotenone (Prentox 7% rotenone) may be used to treat springs to prevent fish from seeking them as freshwater refuges during the

application. We will follow the label recommendations for concentrations for "normal pond use" when treating the lake and connecting waters. On-site assays using caged fish would determine the appropriate concentrations needed, which is estimated to be about 1 mg of Prenfish per 1 liter of water. The persistence of Prenfish in the lake would likely be three to five weeks depending on the amount of fresh water entering the lake from the stream, water temperatures, sunlight intensity, and alkalinity.

Although there is no domestic use of water from Tunnel Lake, signs would be posted to warn people not to drink or to swim immediately after the application of rotenone, in compliance with the product label.

Materials and equipment required to complete the project would be transported to the site by truck. The rotenone would be dispensed in the lake by a small motorboat. Application to the stream would be by drip station, which consists of a 5-gallon container that dispenses a constant amount of rotenone to the stream. The canal seep area and resulting stream is located in an open area dominated by sedges. This stream is confined to a narrow, straight channel with relatively low gradient and minimal habitat complexity.

The treatment period for the stream would last for an estimated eight hours to remove fish from the stream. When the stream treatment ends, fresh water would begin to enter the lake and dilute the rotenone in the lake. We will install a drip station near the mouth of the stream to prevent fresh water from diluting the lake water too quickly. This drip station would run for another eight hours. Caged fish would be used to measure the toxicity of the water in the stream and lake. After the treatment of the stream and lake, caged fish will be used to evaluate when the waters have naturally detoxified. The rotenone label specifies that once caged fish survive 24 hours in treated water, it is considered detoxified and is safe for restocking.

Dead fish that surface will be collected and disposed of properly. Studies in Washington State indicate that approximately 70% of rotenone-killed fish sink to the bottom (Bradbury 1986). Dead fish stimulate plankton growth and aid in plankton recovery.

Trap net and/or gill net sampling will be completed once Tunnel Lake detoxifies to determine the effectiveness of the rotenone treatment. If any live white suckers are sampled, a second treatment will be required to achieve the desired objectives of this project.

Monitoring is a major component of this type of management activity. By way of example, MTFWP conducted extensive monitoring of the 2005 rotenone treatment of Martin Lakes near Olney, MT. The results indicated the lake naturally detoxified with dilution from freshwater within 48 hours. Although very little freshwater was flowing into the Martin lakes, the water was no longer toxic to fish five weeks post-treatment. Plankton blooms were discovered in Martin lakes 160 days after the treatment. Columbia spotted frogs were observed depositing eggs in Martin Lakes the following spring. MTFWP has extensive experience conducting this type of monitoring, and we would employ a similar strategy on Tunnel Lake.

The lake would be restocked with fish in late spring or summer. Approximately 1,000 westslope cutthroat trout fingerlings from Washoe Park State Fish Hatchery will be stocked. An undetermined number of Arctic grayling of multiple age classes will be seined and transplanted from the Sunnyslope Canal either in late spring or in the fall after the irrigation season. A Wild

Fish Transfer Authorization (Permit Number 060418) has been issued by the MTFWP Fish Health Committee to complete these transfers. If we are able to stock larger grayling in late spring, they will provide immediate recreational angling opportunity.

Funding

The proposed action would be funded through regular MTFWP operation budgets for the Choteau Management Area. MTFWP Region 4 personnel would provide any additional manpower required to complete the project.

PART II. ENVIRONMENTAL REVIEW

A. PHYSICAL ENVIRONMENT

1. LAND RESOURCES Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Soil instability or changes in geologic substructure?		X				
b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil which would reduce productivity or fertility?		X				
c. Destruction, covering or modification of any unique geologic or physical features?		X				
d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?		X				
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazard?		X				

2. WATER Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Discharge into surface water or any alteration of surface water quality including but not limited to temperature, dissolved oxygen or turbidity?			X		YES	2a
b. Changes in drainage patterns or the rate and amount of surface runoff?		X				
c. Alteration of the course or magnitude of flood water or other flows?		X				

d. Changes in the amount of surface water in any water body or creation of a new water body?		X				
e. Exposure of people or property to water related hazards such as flooding?		X				
f. Changes in the quality of groundwater?		X				2f
g. Changes in the quantity of groundwater?		X				
h. Increase in risk of contamination of surface or groundwater?			X		YES	see 2a,f
i. Effects on any existing water right or reservation?		X				
j. Effects on other water users as a result of any alteration in surface or groundwater quality?		X				
k. Effects on other users as a result of any alteration in surface or groundwater quantity?		X				
l. Will the project affect a designated floodplain?		X				
m. Will the project result in any discharge that will affect federal or state water quality regulations? (Also see 2a)			X		YES	2m

Comment 2a. This project is designed to intentionally introduce a pesticide to surface water to remove unwanted fish. The impacts would be short-term and minor. Prenfish (5% liquid) and Prentox (7% powder) rotenone are EPA registered pesticides and are safe to use for removal of unwanted fish, when handled properly. The concentration of Prenfish rotenone proposed is 1 mg per 1 liter of water, but may be adjusted within the label allowed limits based upon the results of on-site assays. Although no springs have been found during surveys at the site, we would use Prentox powder in small quantities to prevent fish from entering spring sources.

There are three ways in which rotenone can be detoxified once applied. The most common method is to allow it to naturally breakdown. Rotenone is a compound that is susceptible to natural breakdown (detoxification) through a variety of mechanisms such as water chemistry, water temperature, exposure to organic substances, exposure to oxygen, and sunlight intensity (Ware 2002; ODFW 2002; Loeb and Engstrom-Heg 1971; Engstrom-Heg 1972; Gilderhus et al. 1986). Rotenone persistence studies by Gilderhus et al. (1986) and Dawson et al. (1991) found that in cool water temperatures of 32- to 46^{o}F the half-life ranged from 3.5- to 5.2 days. Gilderhus et al. (1986) reported that 30% mortality was experienced in rainbow trout exposed to degrading concentrations of actual rotenone (0.004 ppm) in 46^{o}F pond water 14 days after a treatment. By day 18 the concentrations were sub-lethal to trout. The second method for detoxification involves basic dilution by freshwater. This may be accomplished by fresh groundwater or surface water flowing into a lake or stream. The final method of detoxification involves the application of an oxidizing agent like potassium permanganate. This dry crystalline substance is mixed with stream or lake water to produce a concentration of liquid sufficient to detoxify the concentration of Prenfish applied. Detoxification is accomplished after about 20-30 minutes of mixing between the two compounds (Prentiss Inc. 1998). Because Tunnel Lake has

no outlet, we will rely on freshwater dilution to detoxify the stream and lake water. Based on similar rotenone treatments in Montana, we expect the stream to detoxify within 48 hours after the drip stations are removed, and we expect the lake to detoxify within three to five weeks post-treatment.

Dead fish will result from this project. Bradbury (1986) reported that approximately 70% of rotenone-killed fish in Washington lakes never surfaced. Although no trout were involved with his study, Parker (1970) reported that at water temperatures of 40^{o}F and less, dead fish required 20-41 days to surface. The most important factors inhibiting fish from ever surfacing are cooler water (<50^{o}F) and deep water (>15 feet). Tunnel Lake would undoubtedly meet both these criteria during a March / April treatment period. Bradbury (1986) reported that 9 of 11 water bodies in Washington treated with rotenone experienced an algae bloom shortly after treatment. This is attributed to the input of phosphorus to the water as a result of decaying fish. Bradbury further notes that approximately 70% of the phosphorus content of the fish stock would be released into the lake through bacterial decay. This action stimulates phytoplankton production, then zooplankton production, and starts the lake toward production of food for fish. This change in water chemistry is viewed as a benefit to stimulate plankton growth. Any changes or impacts to water quality resulting from decaying fish would be short-term and minor.

On July 2007 the creek flowing into the lake was surveyed and surface water inflow was estimated at approximately 1 cfs. The freshwater inputs from this stream would serve to dilute treated water below fish killing concentrations.

Comment 2f: No contamination of groundwater is anticipated to result from this project. Tunnel Lake receives leakage from the Pishkun Reservoir supply canal at the rate of approximately 1 cfs, but it has no surface outflow. Based on this, water must leech out of the lake through its bed or via evaporation. Rotenone binds readily to sediments and is broken down by soil and in water (Skaar 2001; Engstrom-Heg 1971, 1976; Ware 2002). Rotenone moves approximately one inch in most soil types; the only exception is sandy soil where movement is about three inches (Hisata 2002). There are no known groundwater wells in close proximity to Tunnel Lake. The nearest groundwater wells to the project site are located approximately 0.60 miles to the southwest and out of the same natural drainage pathway as Tunnel Lake. In California, studies where wells were placed in aquifers adjacent to and downstream of rotenone applications have never detected rotenone, rotenolone, or any of the other organic compounds in the formulated products (CDFG 1994). Case studies in Montana have concluded that rotenone movement through groundwater does not occur. For example, at Tetrault Lake, Montana, rotenone was not detected in a nearby domestic well, which was sampled two and four weeks after applying 90 ppb rotenone to the lake. This well was chosen because it was down gradient from the lake and also drew water from the same aquifer that fed and drained the lake. In 1998, a Kalispell area pond was treated with Prenfish. Water from a well located 65 feet from the pond was analyzed and no sign of rotenone was detected. In 2001, another Kalispell area pond was treated with Prenfish. Water from a well located 200 feet from that pond was tested four times over a 21-day period and showed no sign of contamination. In 2005, MTFWP treated a small pond with Prenfish to remove pumpkinseeds and bass. A well located 30 yards from the pond was tested and no evidence of Prenfish was found in the well.

Because water leaving Tunnel Lake must travel through lake sediments, soil, and gravel, and rotenone is known to bind readily with these substances, we do not anticipate any contamination of ground water.

Comment 2m: MTFWP will apply for an exemption of surface water quality standards from Montana DEQ under section 308 of the Montana Water Quality Act.

3. AIR **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Emission of air pollutants or deterioration of ambient air quality? (also see 13 (c))			X			3a
b. Creation of objectionable odors?			X			3b
c. Alteration of air movement, moisture, or temperature patterns or any change in climate, either locally or regionally?		X				
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X				
e. Will the project result in any discharge which will conflict with federal or state air quality regs?		X				

Comment 3a: Emissions from outboard motors would be produced, but are expected to dissipate rapidly. Any impacts from these odors would be short-term and minor.

Comment 3b: Liquid formulated rotenone contains aromatic solvents that make it soluble in water. The odor from these solvents may last for several hours to several days, depending on air and water temperatures and wind direction. These relatively "heavy" organic compounds tend to sink (remain close to the ground) and move downwind. The California Department of Pesticide Regulation (CDPR 1998, cited in Finlayson et al. 2000) found no health effects from this odor. Applicators would have the greatest contact with these odors, but would be protected because they would be wearing respirators as the product label recommends. Any impacts caused by objectionable odors would be short-term and minor.

The dead fish that result from this project may cause objectionable odors. This condition is greatly reduced during spring applications. Collecting and/or sinking dead fish in the lake would also help mitigate this. We would expect odors from dead fish to be short-term and minor.

4. VEGETATION Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?			X			4a
b. Alteration of a plant community?		X				
c. Adverse effects on any unique, rare, threatened, or endangered species?		X				
d. Reduction in acreage or productivity of any agricultural land?		X				
e. Establishment or spread of noxious weeds?		X				
f. Will the project affect wetlands, or prime and unique farmland?		X				

Comment 4a: Tunnel Lake is located in the Rocky Mountains- Plains interface with one primitive boat launch area to stage this operation from. There is a small, user-created parking area near the lake that will also be used during the project. Thus, there should be no trampling of vegetation around the lake. There will be some trampling of vegetation along the seep inlet during the placement and monitoring of drip stations and sentinel fish locations, but this will be short-term and minimal. No direct, immediate, or long-term impacts to vegetation are anticipated from the treatment itself because at concentrations used to kill fish, rotenone does not negatively affect plants.

5. FISH/WILDLIFE Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Deterioration of critical fish or wildlife habitat?		X				
b. Changes in the diversity or abundance of game animals or bird species?			X		yes	5b
c. Changes in the diversity or abundance of nongame species?			X		yes	5c
d. Introduction of new species into an area?		X				
e. Creation of a barrier to the migration or movement of animals?		X				
f. Adverse effects on any unique, rare, threatened, or endangered species?			X			5f
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?		X				

h. Will the project be performed in any area in which T&E species are present, and will the project affect any T&E species or their habitat? (Also see 5f)		X				
i. Will the project introduce or export any species not presently or historically occurring in the receiving location? (Also see 5d)		X				

Comment 5b: This project is designed to kill undesirable fish. Previously stocked rainbow trout, westslope cutthroat trout and Arctic grayling are game species that would be eliminated from Tunnel Lake. Non-targeted fish that would be killed incidentally in the implementation of this project is the spottail shiner, a non-native minnow that was likely illegally introduced into the lake. These impacts would be short-term and minor because the lake would be restocked with Artic grayling and westslope cutthroat trout. Efforts will be made to capture and transplant Arctic grayling currently residing in Tunnel Lake.

Comment 5c: Non-game species that might be inadvertently impacted by this project include zooplankton, some aquatic insects, and possibly some amphibians. Amphibian and reptile surveys in the vicinity of Tunnel Lake have identified the presence of the western terrestrial garter snake and tiger salamander. Numerous studies indicate that rotenone has temporary or minimal affects on aquatic insects and plankton. Anderson (1970) reported that comparisons between samples of zooplankton taken before and after a rotenone treatment did not change a great deal. Despite the inherent natural fluctuations in zooplankton communities, the application of rotenone had little affect on the zooplankton community. Cook and Moore (1969) reported that the application of rotenone had little lasting effect on the non-target insect community of a stream. Kiser et al. (1963) reported that 20 of 22 zooplankton species re-established themselves to pre-treatment levels within about 4 months of a rotenone application. Cushing and Olive (1956) reported that the insects in a lake treated with rotenone exhibited only short-lived effects. Hughey (1975) concluded that three Missouri ponds treated with rotenone showed little short-term and no long-term effect on population levels of zooplankton. The effects of rotenone on plankton were consistent with the natural variability that is characteristic of plankton populations, and re-colonization was rapid and reached near pre-treatment levels within eight months.

Both Anderson (1970) and Kiser et al. (1963) reported that most zooplankton species survive a rotenone treatment via their highly resilient egg structures. In addition, parthenogenesis of some female plankton occurs, causing sexual dimorphism, which greatly increases plankton density in times of population distress. Among the aforementioned studies variation in climate, physical environment, and water chemistry would likely cause subtle differences in results in other areas.

Case studies conducted on Devine Lake in the Bob Marshall Wilderness from 1994-1996 indicate that invertebrates actually increased in number and very slightly increased in diversity following a rotenone treatment (Rumsey et al. 1996). This is supported by observations made by Cushing and Olive (1956), who reported that oligochaetes (worms) increased in number after a rotenone treatment then became stable. *Gammarus* species (fresh water shrimp), a common fish food item, were detected in Devine Lake only when fish were present. Neighboring Ross Lake, in the Bob Marshall Wilderness, is fishless and was used to measure natural insect and plankton

variation during the Devine Lake treatment and evaluation. *Gammarus* species were never detected in Ross Lake, although it is fishless. Invertebrate numbers in Ross Lake were reported to be relatively stable, but the diversity of insects fluctuated considerably over time.

The most recent example of monitoring plankton from a rotenone treatment occurred on Martin Lakes near Olney in 2005. Table 1 demonstrates the post-treatment zooplankton densities were similar to the pre-treatment densities. Based on these findings, we would expect the impacts to zooplankton to be short-term and minor.

Table 1. Relative abundances of plankton in Martin Lakes pre- and post-rotenone treatment, 2005-06.

Upper Martin Lake:

2005 (pre-treatment)		**2006 (post-treatment)**	
Date Sampled	Quantity/liter	Date Sampled	Quantity/liter
16-Jun-05	24.70	16-Jun-06	0.85
21-Jul-05	5.67	10-Jul-06	19.15
06-Aug-05	8.63	16-Aug-06	9.77
03-Oct-05	4.70	18-Oct-06	4.75

Lower Martin Lake:

2005 (pre-treatment)		**2006 (post-treatment)**	
Date Sampled	Quantity/liter	Date Sampled	Quantity/liter
16-Jun-05	24.19	16-Jun-06	3.76
21-Jul-05	17.82	10-Jul-06	7.46
06-Aug-05	24.60	16-Aug-06	15.43
03-Oct-05	7.71	18-Oct-06	8.46

The effects of rotenone on non-target organisms have been studied extensively. Mammals, in general, are not affected because they neutralize rotenone by enzymatic action in their stomach and intestines (AFS 2002). Laboratory tests fed forms of rotenone to rats and dogs as part of their diet for periods of six months to two years (Marking 1988). Researchers observed effects such as diarrhea, decreased food consumption, and weight loss, and reported that despite unusually high treatment concentrations of rotenone in rats and dogs, it did not cause tumors or reproductive problems in mammals. CDFG (1994) studies on potential risks to terrestrial animals found that a 22-pound dog would have to drink 7,915 gallons of lake water within 24 hours, or eat 660,000 pounds of rotenone-killed fish, to receive a lethal dose. The State of Washington reported that a half-pound mammal would need to consume 12.5 mg of pure rotenone to receive a lethal dose (Bradbury 1986). Considering the only conceivable way an animal can consume the compound under field conditions is by drinking lake or stream water, a half-pound animal would need to drink 33 gallons of water treated at 2 ppm. Similar results determined that birds required levels of rotenone at least 1,000 to 10,000-times greater than is required for lethality in fish (Skaar 2001). Cutkomp (1943) reported that chickens, pheasants and members of lower orders of *Galliformes* were quite resistant to rotenone, and four day old chicks were more resistant than adults. Ware (2002) reports that swine are uniquely sensitive to rotenone and it is slightly toxic to wildfowl, but to kill Japanese quail required 4,500 to 7,000 times more than is used to kill fish. One study, in which rats were injected with rotenone for a period of weeks, reported finding lesions characteristic of Parkinson's disease (Betarbet et al. 2000). However, the results have been challenged on the basis of methodology: (1) that the

continuous intravenous injection method used leads to "continuously high levels of the compound in the blood," and (2) second, that dimethyl sulfoxide (DMSO) was used to enhance tissue penetration (normal routes of exposure actually slow introduction of chemicals into the bloodstream). Finally, injecting rotenone into the body is not a normal way of assimilating the compound. Similar studies (Marking 1988) have found no Parkinson-like results. Extensive research has demonstrated that rotenone does not cause birth defects (HRI 1982), gene mutations (Van Geothem et al. 1981; BRL 1982) or cancer (Marking 1988). Spencer and Sing (1982) reported that rats that were fed diets laced with 10- to 1,000 ppm rotenone over a 10-day period did not suffer any reproductive dysfunction. Rotenone was found to have no direct role in fetal development of rats that were fed exceedingly high concentrations of rotenone. Typical concentrations of actual rotenone used in fishery management range from 0.025- to 0.50 ppm and are far below that administered during most toxicology studies.

Chandler and Marking (1982) found that clams and snails were between 50 and 150 times more tolerant than fish to Noxfish (5% rotenone formulation), and Southern Leopard frog tadpoles were between 3 and 10 times more tolerant than fish. Grisak et al. (2007) conducted laboratory studies on long-toed salamanders, Rocky Mountain tailed frogs, and Columbia spotted frogs and concluded that the adult life stages of these species would not suffer an acute response to rotenone but the larval and tadpole stages could be affected by rotenone at fish killing concentrations. These authors recommended implementing rotenone treatments at times when the larva were not present, such as in the early spring or later in the fall.

It is important to note that nearly all of these examples involved subjecting laboratory specimens to unusually high concentrations of rotenone, or conducting tests on animals that would not be exposed to rotenone during normal use in fisheries management. Based on this information we would expect the impacts to non-target organisms to range from non-existent to short-term and minor.

Comment 5f: Dead fish will result from this project. It is possible that ospreys or eagles might consume rotenone-killed fish. There are five bald eagles nests located along the Sun River within 30 miles of the project site. The closest nest site is located approximately 10.5 miles southeast of Tunnel Lake. There is one known osprey nest on the upper reaches of the North Fork of the Sun River. Additionally, there may be migrant bald eagles and ospreys in the vicinity of Tunnel Lake during the proposed project implementation dates. With the proximity of many other waters (e.g., Sun River, Pishkun Reservoir, Willow Creek Reservoir, Nilan Reservoir), Tunnel Lake is not a critical foraging area for nesting and migrant bald eagles and ospreys. Efforts to remove rotenone-killed fish that surface following treatment would minimize any potential risks to either bald eagles or ospreys; thus, potential impacts would be short-term and negligible. Long-term impacts from removing Tunnel Lake's white sucker population would not be significant because Arctic grayling and westslope cutthroat trout will be restocked soon after the lake detoxifies. See comment 5c for impacts to birds.

Grizzly bears are present in this area but are not dependant on the lake or fish in the lake for food. The infrequent occurrence of grizzly bears in this area, human activity related to the project implementation, and the removal of dead fish resulting from this project would contribute to reducing potential for this species to consume rotenone-killed fish. Because this project is proposed for springtime, we would anticipate periodic surfacing of dead fish. Post-treatment, we will frequently monitor the lake to collect dead fish to prevent them from becoming an attractant

to bears. The project itself would not have an impact on grizzly bears. See comment 5c for impacts to mammals.

The project site is within the range of the gray wolf. The Monitor Mountain pack and individual transient wolves may periodically use this area, but they are not dependant on the lake or fish in the lake as a food source. The impacts to wolves would be non-existent to minor and short-term for the same reasons as the grizzly bear. See comment 5c for impacts to mammals.

Migratory waterfowl will likely be present during the proposed treatment period and may be displaced from Tunnel Lake, but the availability of other waters in close proximity to the project area should minimize any impacts. Common loons are not known to use Tunnel Lake, but other fish-eating birds that may be present during the treatment period include common merganser, pied-billed grebe, western grebe, great blue heron, American white pelican, double-crested cormorant, and ring-billed gull. Any of these birds may feed on rotenone-killed fish carcasses shortly after treatment. However, research has indicated it is not physiologically possible for birds to consume sufficient quantity of rotenone-killed fish to result in a lethal dose. See comment 5c for impacts to birds.

The seasonal or year-round distributions of antelope, elk, mountain lion, black bear, and mule and white-tailed deer include the project area. It is possible any of these species may ingest water from the lake during the treatment period. There are no effects on mammals from drinking rotenone-treated water. See comment 5c for impacts to mammals.

B. HUMAN ENVIRONMENT

6. NOISE/ELECTRICAL EFFECTS Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Increases in existing noise levels?			X			6a
b. Exposure of people to serve or nuisance noise levels?		X				
c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X				
d. Interference with radio or television reception and operation?		X				

Comment 6a: The only noise generated from this project would result from use of an outboard motor during application of the rotenone. The noise generated from these activities would be short-term and minor.

7. LAND USE Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X				
b. Conflicted with a designated natural area or area of unusual scientific or educational importance?		X				
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?	X					7c
d. Adverse effects on or relocation of residences?		X				

Comment 7c: Depending on when this project may be initiated, the project timeframe may overlap with the starting date of Montana's general spring bear hunting season on April 15. However, it is uncommon for black bears to use this area and we do not expect any displacement of bears that would affect hunters or hunting opportunity. Any impacts from displacement would be short-term and minor.

8. RISK/HEALTH HAZARDS Will the proposed action result in:	IMPACT Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated	Comment Index
a. Risk of an explosion or release of hazardous substances (including, but not limited to oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?			X		YES	8a
b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan?			X		YES	8b
c. Creation of any human health hazard or potential hazard?			X		YES	see 8a,c
d. Will any chemical toxicants be used?			X		YES	see 8a

Comment 8a: The principal risk of human exposure to hazardous materials from this project would be limited to the applicators. All applicators would wear safety equipment listed on the product labels such as respirator, goggles, rubber boots, Tyvek overalls, and nitrile gloves. All applicators would be trained on the safe handling and application of the piscicide. At least one, and most likely several, Montana Department of Agriculture certified pesticide applicators would supervise and administer the project. Rotenone would be transported, handled, applied and stored according to the label specifications to reduce the probability of human exposure or spill.

Comment 8b: MTFWP has a treatment plan for rotenone projects. This plan addresses many aspects of safety for people who are on the implementation team such as establishing a clear

chain of command, training, delegation and assignment of responsibility, clear lines of communication between members, spill contingency plan, first aid, emergency responder information, personal protective equipment, monitoring and quality control, among others. Implementing this project should not have any impact on existing emergency plans. Because an implementation plan has been developed by MTFWP the risk of emergency response is minimal and any affects to existing emergency responders would be short-term and minor.

Comment 8c: Although pesticides are widely used to control unwanted species, legitimate public concerns have been raised regarding the safety and health effects to humans. As with any pesticide, direct exposure to, or consumption of piscicides at full strength, can have harmful or sometimes fatal effects on humans. Rotenone is an EPA registered pesticide under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

Although Montana does not have established water quality standards for rotenone, they have addressed life long exposure limits (cited from BPA 2004):

"There are no federal or Montana numeric water quality standards for rotenone; however, MDEQ (2001) used the EPA method of calculating human health criteria based on noncarcinogenic effects to estimate a safe level for life long exposure to water and the consumption of fish exposed to water containing rotenone: 40µg/L water plus fish. The calculation is based on several assumptions:

- Long-term (70 years) exposure,
- Average body mass of 70 kg (BW),
- A person consumes 2 L of water per day (DI),
- A person consumes 0.0065 kg of fish per day (FI),
- Reference Dose (RfD) for rotenone = 0.004 mg/kg-day (from EPA, Integrated Risk Information System, IRIS)
- Some chemicals tend to increase in fish tissue over the concentration in the water or bio-concentrate. The amount the chemical increases in the fish relative to the ambient concentration is the bio-concentration factor (BCF). The BCF does not include possible food chain effects.

The calculation of the Rotenone criteria is as follows:

0.004 mg/kg-day (RfD) * 70 kg (BW)
2 L/day (DI) + (0.0065 kg/day (FI) * 770 L/kg (BCF))

The rotenone formulation that would be used contains five percent active ingredient. When the formulation is applied to achieve 1 mg/L in the waterbody, the active ingredient concentration is 0.05 mg/L or 50 µg/L. The target concentration would be 10µg/L above the calculated long-term safe level. But the long-term safe level was determined using the standard assumption that fish would be exposed to rotenone and be able to bio-concentrate rotenone. This assumption is extremely protective. Rotenone is a natural chemical but is not naturally found in Montana, and is not a chemical likely to be found in fish that are commercially available for consumption. Fish exposed to rotenone at the target concentration would die within two to three hours; thus bio-concentration is very unlikely. Most of the dead fish in the treated lakes would sink to the bottom of the lake. Fish that wash up during the crew's presence at the lake would be collected for proper disposal. The potential long-term risk to humans with water as their only source of rotenone exposure yields 140µg/L as a safe long-term concentration.

Since tissue and water concentrations of rotenone decline quickly after a treatment, and people would not likely be exposed to treatments on a continual basis, hazardous life-long exposure to rotenone is extremely unlikely. Public health issues surrounding the use of rotenone have been studied extensively. In general, the EPA through FIFRA certification process has concluded that the use of rotenone for fish control does not present a risk of unreasonable adverse effects to humans and the environment (Finlayson, et al. 2000) as long as the label instructions are followed.

In their description of how South American Indians prepare and apply *Timbó*, a rotenone parent plant, Teixeira, et al. (1984) reported that the Indians extensively handled the plants during a mastication process, and then swam in lagoons with the plant pulp on their backs for distribution. No harmful effects were reported.

Finlayson, et al. (2000) reported that the EPA "has concluded that the use of rotenone for fish control does not present a risk of unreasonable adverse effects to humans and the environment." In relation to air quality, they further note that "No public health effects from rotenone use as a piscicide have been reported." No waiting period is specified for swimming in rotenone-treated water. Aside from the rotenone itself, liquid formulations also consist of petroleum emulsifiers. Finlayson (2000) wrote regarding the health risks of these constituent elements:

> " . . . the EPA has concluded that the use of rotenone for fish control does not present a risk of unreasonable adverse effects to humans and the environment. The California Environmental Protection Agency found that adverse impacts from properly conducted, legal uses of liquid rotenone formulations in prescribed fish management projects were nonexistent or within acceptable levels (memorandum from J. Wells, California Department of Pesticide Regulation, to Finlayson, 3 August 1993). Liquid rotenone contains the carcinogen trichloroethylene (TCE). However, the TCE concentration in water immediately following treatment (less than 0.005 mg TCE per liter of water [5 ppb]) is within the level permissible in drinking water (0.005 mg TCE per liter of water, EPA 1980b). None of the other materials including xylenes, naphthalene, piperonyl butoxide, and methylnaphthalenes exceed any water quality criteria guidelines (based on lifetime exposure) set by the EPA (1980a, 1981a, 1993). Many of these materials in the liquid rotenone formulations (trichloroethylene, naphthalene, and xylene) are the same as those found in fuel oil and are present in waters everywhere because of the frequent use of outboard motors . . ."

California Department of Fish and Game (CDFG 1994) calculated that the maximum expected level of these contaminants following a treatment level of 2 ppm formulation are TCE 1.1 ppb; toluene 84 ppb; xylenes 3.4 ppb; naphthalene 140 ppb.
The product label states:

> " . . . do not use dead fish for food or feed, do not use water treated with rotenone to irrigate crops or release within ½ mile upstream of a potable water or irrigation water intake in a standing body of water such as a lake, pond, or reservoir. . . . do not allow swimming in rotenone treated water until the

application has been completed and all pesticide has been thoroughly mixed into the water according to the labeling instructions. This product is flammable and should be kept away from heat and open flame . . ."

The major risks to human health from rotenone come from accidental exposure during application. This is the only time when humans are exposed to concentrations that are greater than that needed to remove fish. To prevent accidental exposure to liquid formulated or powdered rotenone, the Montana Department of Agriculture requires applicators to be:

- Trained and certified to apply the pesticide in use
- Equipped with the proper safety gear, which, in this case, includes fitted respirator, eye protection, rubberized gloves, hazardous material suit
- Have product labels with them during use
- Contain materials only in approved containers that are properly labeled
- Adhere to the product label requirements for storage, handling, and application" (end of citation from BPA 2004)

Any threats to human health during application could be greatly reduced with proper use of safety equipment. Recreationists in the area would likely not be exposed to the treatments because a temporary road closure would preclude many from being in the area. Proper warning through news releases, signing the project area, road closure and administrative personnel in the project area should be adequate to keep unintended recreationists from being exposed to any treated waters. Dead fish would be collected and sunk in the lakes or removed from the site. Administering application in the early spring would further reduce exposure due to the relatively low number of users in this area.

There is an inhalation risk to ground applicators. To guard against this, ground applicators would be equipped with protective clothing, eye protection, and breathing equipment.

9. COMMUNITY IMPACT **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X				
b. Alteration of the social structure of a community?		X				
c. Alteration of the level or distribution of employment or community or personal income?		X				
d. Changes in industrial or commercial activity?		X				
e. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X				

10. PUBLIC SERVICES/TAXES/UTILITIES **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify: _____		X				
b. Will the proposed action have an effect upon the local or state tax base and revenues?		X				
c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: electric power, natural gas, other fuel supply or distribution systems, or communications?		X				
d. Will the proposed action result in increased used of any energy source?		X				
e. Define projected revenue sources		X				
f. Define projected maintenance costs		X				

11. AESTHETICS/RECREATION **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?		X				
b. Alteration of the aesthetic character of a community or neighborhood?		X				
c. Alteration of the quality or quantity of recreational/tourism opportunities and settings? (Attach Tourism Report)			X			See 11c
d. Will any designated or proposed wild or scenic rivers, trails or wilderness areas be impacted? (Also see 11a, 11c)		X				

Comment 11c: The primary objective of this is to improve angling quality at Tunnel Lake that may result in increased use by recreationists. The benefits of increased recreational use would outweigh any short-term social impacts associated with the actual treatment. Any impacts to aesthetics would be short-term and minor and be directly associated with the actual rotenone treatment and immediate aftermath, including dead fish in the project area. No tourism report is necessary to quantify these impacts.

12. CULTURAL/HISTORICAL RESOURCES **Will the proposed action result in:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Destruction or alteration of any site, structure or object of prehistoric historic, or paleontological importance?		X				
b. Physical change that would affect unique cultural values?		X				
c. Effects on existing religious or sacred uses of a site or area?		X				12c
d. Will the project affect historic or cultural resources?		X				

Comment 12c: The project is located within the aboriginal range of the Blackfeet, Salish and Kootenai, Chippewa Cree and Little Shell Tribe of the Cree Nation. There will be no ground breaking activities associated with this project, and no known cultural or religious ceremonies proposed for the same time this project is proposed. There will be no impacts to historical, cultural or religious values.

13. SUMMARY EVALUATION OF SIGNIFICANCE **Will the proposed action, considered as a whole:**	**IMPACT Unknown**	**None**	**Minor**	**Potentially Significant**	**Can Impact Be Mitigated**	**Comment Index**
a. Have impacts that are individually limited, but cumulatively considerable? (A project or program may result in impacts on two or more separate resources which create a significant effect when considered together or in total.)		X				
b. Involve potential risks or adverse effects which are uncertain but extremely hazardous if they were to occur?		X				

c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan?		X				
d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X				
e. Generate substantial debate or controversy about the nature of the impacts that would be created?	X	X			yes	13e
f. Is the project expected to have organized opposition or generate substantial public controversy? (Also see 13e)	X	X				13f
g. List any federal or state permits required.						13g

Comment 13e and 13f: The use of pesticides can generate controversy from some people. Public outreach and information programs can educate the public on the safe and effective use of pesticides. It is not known if this project will have organized opposition. One reason that MTFWP is considering this course of action is based on public reports that Artic grayling and trout growth in Tunnel Lake is poor. This project would serve to reverse that condition.

In part, this project was initiated by public requests for diversity in the area fishery. Tunnel Lake has provided a unique opportunity to catch two of Montana's native fish species in a small lake environment. Several lakes within 10 miles of Tunnel Lake provide a fishery for northern pike, yellow perch, rainbow trout and kokanee salmon.

Comment 13g: The following permits will be required:

- DEQ 308 - Department of Environmental Quality (authorization for short term exemption of surface water quality standards for the purpose of applying a fish toxicant)
  A Montana Department of Agriculture certified applicator will be present during all treatments
  The department consulted with the U.S. Bureau of Reclamation during the planning and development phases of this project. No special use permit is required by this agency.

PART III. ALTERNATIVES

Alternative 1 – No Action

The no action alternative would allow status quo management to continue which would maintain or reduce the present angling opportunity and quality in Tunnel Lake.

Alternative 2 – Rotenone treatment and restocking with mixed westslope cutthroat trout and Arctic grayling fishery (Proposed Action)

The proposed action involves removing the aforementioned species from the lake and short stream segment using Prenfish and Prentox rotenone. Following treatment and detoxification, the lake would be restocked with westslope cutthroat trout and Artic grayling. Based on the depth of this lake, MTFWP file reports, past management experience, and reports by anglers, these two species are expected to thrive in this type of lake environment.

This alternative offers the highest probability of achieving the goals of improving the recreational fishery in Tunnel Lake for public use.

Alternative 3 – Mechanical Removal

This alternative would involve using gill nets and/or trap nets to selectively remove white suckers. Once adequate numbers were removed, Tunnel Lake would be restocked with westslope cutthroat trout and Arctic grayling.

Under specific conditions, gill nets have been successfully used to remove unwanted fish from lakes. Bighorn Lake, a 5.2-acre lake located in Banff National Park in Alberta, Canada, was gillnetted from 1997 to 2000 to remove an unwanted population of brook trout (Parker et al. 2001). Over 10,000 net nights (1 net night = 1 net set overnight for at least 12 hours) were conducted over a four-year period in Bighorn Lake to remove the population that totaled 261 fish. The researchers concluded that the removal of non-native trout using gill nets was impractical for larger lakes (> 5 acres). In clear lakes, trout have the ability to become acclimated to the presence of gill nets and avoid them. These researchers reported observing brook trout avoiding gill nets within about 2 hours of being set.

Knapp and Matthews (1998) reported that Maul Lake, a 3.9-acre lake in the Inyo National Forest in California, was gill netted from 1992 to 1994 to remove a population of brook trout. The population, which totaled 97 fish, was successfully removed with an effort of 108 net days. The researchers reported that following the removal of brook trout from Maul Lake it was mistakenly restocked with rainbow trout. Efforts to remove them using gill nets were implemented immediately. From 1994 through 1997, 4,562 net days were required to remove the 477 rainbow trout from the lake. These researchers reported that gill nets could be used as a viable alternative to chemical treatment. They acknowledged that the small size and shallow depth of Maul Lake leant itself to a successful fish eradication using gill nets. Their criteria for successful fish removal using gill nets include lakes less than 3.9 surface acres, less than 19 feet deep, with little or no inflow or outflow to perpetuate reinvasion, and no natural reproduction. Although not tested, the maximum size of a lake that they felt could be de-populated using gill nets was 7.4 surface acres and 32 feet deep.

No information was found that described the probability of success in using gill nets or trap nets to completely remove white suckers from Tunnel Lake. In any event, Tunnel Lake exceeds surface area criteria described by other researchers.

Deploying gill nets and traps requires frequent presence at the site to check and reset nets. To attempt this method of fish removal at Tunnel Lake would require an unreasonable time and manpower commitment. Due to these considerations and expected incomplete results, this alternative has a low probability of meeting the project objectives.

PART IV. ENVIRONMENTAL ASSESSMENT CONCLUSION SECTION

A) Is an EIS required? No

This environmental review demonstrates that the impacts of this proposed project are not significant. The proposed action would benefit the fishery of Tunnel Lake with minimal impact on the physical, biological, or the human environment, and thus would not require the detailed environmental review of an Environmental Impact Statement.

B) Public Involvement.

This EA will be posted on the MTFWP internet site (http://fwp.mt.gov/publicnotices/), and mailed directly to interested persons. Any interested citizen will be encouraged to contact the preparer of this EA to discuss the proposal.

C) Duration of the comment period?

The comment period is 30 days. Public comment will be accepted until **April 3, 2008.**

D) Name, title, address, and telephone number of the Person Responsible for Preparing the EA Document

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